

case in which certain steady currents are separated from each other by areas of quasi-discontinuous motion, viz, of steady currents separated by whirls, rolls, vortex rings, cyclonic or anticyclonic vortices, or other forms of discontinuous motion. If these possible discontinuities harmonize with the observed areas of steady wind and pressure, then we shall recognize the precise mechanism by which our storms originate in the general circulation. But it will still, probably, always be true that the development from a modest initial low to a destructive storm depends upon the condensation of the moisture carried by the lower atmosphere.

The method of study by the use of isostaths introduced in The Preparatory Studies and the accompanying tables, which were afterwards published in the Smithsonian Meteorological Tables of 1893, are much improved upon by the use of the isosteres and other details of the method of Bjerknes and Sandström and will, doubtless, be still further improved by the studies now being prosecuted by Professor Bigelow.

#### NEW METEOROLOGICAL STATIONS NEEDED.

Two parties will be dispatched at an early date by the United States Geological Survey to explore the region in Alaska north of the Yukon River. One of these parties will start from some point on the Koyukuk River, cross over to the shores of the Arctic Ocean, and return by a different route. The other party will proceed from some point on the upper Koyukuk westward to Kotzebue Sound.

In view of the fact that but little is known concerning the meteorological conditions of this region, it is undoubtedly desirable that the necessary instruments should be carried thither, and if possible one or more permanent stations be established. It seems likely that voluntary observers of temperature, rainfall, wind, and weather can be found even in this region. Unfortunately, the demands for apparatus at the regular stations and the steady increase in our home stations, forces the Weather Bureau to decline requests for new stations or explorations in distant regions, as its supply of instruments on hand is generally at a very low ebb and oftentimes quite exhausted. There is no branch of science that is expanding more rapidly than meteorology, and still further expansion in the future is inevitable. The general study of the atmosphere demands at least one good station for every circle of 200 miles in diameter, or say, 30,000 square miles, and the fact that we have perhaps twice as many within the United States simply shows how many local conditions must be provided for and that the Weather Bureau must provide for local peculiarities as well as the general study of the atmosphere.

The great westerly currents that prevail high above the North Pacific Ocean and Alaska have such an influence upon the weather that is brought to America that we shall never fully understand our daily weather map until we appreciate what is going on far to the westward and far above us. It would seem that the nations of the globe must by some international arrangement provide at joint expense for regular meteorological stations on the smaller islands of the Atlantic and Pacific and in the less frequented portions of the continents.

#### LIGHTNING FROM CLOUDLESS SKIES.

A letter from Mr. A. B. Elmer, Northfield, Mass., referring to page 292-3 of the MONTHLY WEATHER REVIEW for July, says:

The phenomena observed from Newburg, N. Y., as between south-east and east, was observed from here as between south-southwest and south-southeast, and seemed to approximate the same distance. I had

supposed it to be a thunderstorm over Long Island or the ocean, rather than a "lightning aurora." The New England Weather Bulletin shows no rain at the voluntary stations in Connecticut that day, and I have not access to the New York State bulletin.

The rest of Mr. Elmer's communication is devoted to the remarkable meteorological phenomena of November 7, 8, and 9. The severe storms that passed over New England on Thursday, November 8, are worthy of a special study, such as can only be attained by the comparison of the reports from many stations. Over a large region warm rain, heavy hail, snow, thunderstorms, and over Narragansett Bay a fine waterspout are only some of the more conspicuous peculiarities. In conclusion, Mr. Elmer says:

Except for the September gale, and a number of frequent thunderstorms, this thunderstorm in November, with a temperature under 62°, which is the usual limit for lightning, is the first unusual meteorological phenomenon since the sudden temperature changes of May, and the high temperatures of October. On May 11, 1900, I observed a minimum temperature of 15.5° and on May 14 a maximum of 95.5° being a rise of 80° in three days.

#### LAKE COMMERCE AND INSURANCE.

Prof. H. J. Cox communicates the special report on lake marine losses for the year 1900, compiled by Mr. H. J. Carr, of Chicago, the manager of the Lake Marine News. Mr. Carr says:

Marine underwriters have come out better during the season just closed than during many previous years. The long list of losses comprised mainly vessels that had attained an age which prevented insurance. \* \* \* There were reported in the Marine Insurance Bulletin, during the season of 1900, 502 losses of all kinds, as compared with 569 losses in 1898 and 386 in 1899. \* \* \* The most dangerous parts of the Great Lakes, as shown by the record of losses, lay between Lake Huron and Lake Erie. \* \* \* Taking into comparison the character and age of the ships lost with the new tonnage under construction, the rapid change in the lake marine becomes marked. No more boats like those that have passed away are being built. Practically nothing but steel ships of large size are under construction.

In the navigation of the Great Lakes, the most marked feature during the October storms was the caution displayed by masters in keeping in harbors of refuge. One night 67 boats were sheltered at Harbor Beach, in Lake Huron, and for a week navigation was practically at a standstill, so careful were masters in keeping out of dangerous seas. It was doubtless due to this caution that October, with its cycle of storms, saw so few losses of vessels and lives. Much closer attention was paid to the warnings of the Weather Bureau than ever before. The rapid extension of that service and the construction of warning towers at all important points has added greatly to its efficiency. The next move will be the adoption of wireless telegraphy from many of the warning towers, by which warnings can be passed from the towers to passing vessels.

The above report is written from the point of view of the marine underwriter, but in the Chicago Chronicle of December 12 we find another view of the case, suggested by the fact that a large percentage of the commerce of the lakes is transacted without any marine insurance. The Chronicle says:

The tempests on the lakes have been violent and disastrous to vessel property. In some wrecks the crews and passengers were lost. In fact, the entire season of navigation on the lakes has been remarkable for the number of persons drowned in shipwrecks. The loss of life is greater by 20 per cent than during any recent previous year.

The temptations of vessel owners to defy the winds and waves after the season of navigation should close have been very great. Cargoes more than sufficient to fill all the available vessel room are constantly offered at high rates. This fact applies to both ocean and lake commerce.

On the lake the pressure to get grain cargoes to the seaboard and the pressure to get coal and merchandise from the East before railroad winter rates go soaring upward has caused the employment of every vessel by which shipments could be made. The insurance season expired some time ago. The weather office hourly hangs out danger warnings; but steam and sail craft continue to start out on their perilous voyages. Passengers court the dangers of winter inland and ocean navigation.